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## CERDEC Develops Process to Transmit Photos via SINCGARS

By **Cindy Baroni**  
**CERDEC Knowledge Center**

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If it's true that a picture's worth a thousand words, then a new capability developed by the Communications – Electronics Research, Development and Engineering Center will provide soldiers a way to describe a situation or condition with just a single image

The CERDEC Space and Terrestrial Communications Directorate and the Intelligence and Information Warfare Directorate (I2WD) worked to develop a method by which common field items could be used to send digital photos over SINCGARS radios.

The project came about in January when soldiers on another I2WD and S&TCD collaboration relayed the need to document things they discovered during missions, said CERDEC Electronics Engineer Chris Wantuck.

"Instead of having to hand-carry the picture, we thought, 'Why not transmit it and get it to a central point where it could actually be looked at by people in theatre and back home,'" Wantuck said. "What was missing was a way of being able to rapidly get that information back."

Because CERDEC engineers wanted the capability to be as widely used as possible, they knew the process they developed would have to use equipment that most units already had in their possession.

"That's one of the things we were striving for. Commonality," Wantuck added.

And they achieved it.

Using a SINCGARS, a Miltope Laptop, any commercial digital camera and a few interface cables, our soldiers are now able to send images that could increase survivability, situational awareness and aid in battlefield planning and decision-making.

The engineers hope that soldiers in the field use this new capability to immediately transmit pictures, such as those of people being sought, strange and unusual devices found or stockpiles of contraband, to their tactical operations centers.

"This has a direct effect on users in the field," said Tim Leising, an S&TCD electrical engineer who worked on the process.

And it was that direct effect that led to the engineers believing so strongly in the potential for the process that they developed it within two months.

"It's very rare that you see systems come together as quickly as this one has," said Dominic Satili, chief of S&TCD's Tactical Radio Branch, which developed the system. "I think the credit goes to all the people here at CERDEC. Because this system had direct impact on the lives of soldiers in Iraq, the engineers were highly motivated to make this happen."

The engineers are also motivated to spread the word about this new capability that is available to almost any unit at no additional cost.

If anyone is interested in implementing this method of sending photos, the directions are on Army Knowledge On-line's document library at <https://www.us.army.mil/suite/doc/1568663> , or call (732) 427-1702.



**The CERDEC-developed process allows units in the field to transmit one 60KB photo over a SINCGARS radio in less than one minute without any additional equipment or cost. (CERDEC Courtesy Photo)**

## TARDEC achieves staggering advancements in fuel cell technology

*By: MAJ Edwin Leathers, Erik Kallio, Mike Berels and Bill Bradford*

One of the key challenges facing the US Army today is the ability to provide power to the Soldier and its tactical vehicles which are not being fulfilled by the current power generating capability. Current military vehicle electrical sources are limited in supplying power for extended periods of time, thus limiting tactical tasks such as command and control, digital communication, silent watch and continuous power generation independent of the main engines. Electrical power demands for military vehicles will exceed the current capabilities across all platforms due to new advances in technologies being spiraled into these systems. The US Army Tank-Automotive Research, Development and Engineering Center, has developed a fuel cell program with the objective to deliver a 10 kW fuel cell auxiliary power unit powered by logistic fuel

### Risk Mitigation

For this program to succeed, TARDEC has worked intimately with vehicle program managers to solicit their specific needs and requirements. This has resulted in a clear definition of needs and requirements that address current and Unit of Action power requirements, form, fit and functionality. The program has been designed as a collaborative task among R&D efforts and activities within government and industry, with a focus on fuel cells, desulphurization and hydrogen generation via JP8 reforming. The goal is to capture knowledge developed by these partners for the purpose of risk mitigation and cost savings.

TARDEC is developing MOA's with many of the other Department of Defense and government agencies to leverage their current efforts in fuel cell component development. Additionally, many of the NAC programs will be enablers to this effort. These MOA's and joint programs will be the risk mitigators for the technology development. This will allow the TARDEC program to focus on fuel reformation and integration issues.

### History

Through January 2004, TARDEC's fuel cell program was centered in its National Automotive Center. The NAC specializes in dual-use technologies, those that have both military and commercial applications. The program can be characterized as being fuel cell neutral and moving incrementally toward JP8 fueled systems in both component development and system demonstrations.

A significant early demonstration was of the first liquid fueled, fuel cell APU on a vehicle. This was a methanol fueled, proton exchange membrane APU on a Freightliner long-haul tractor. The system was developed and built by Ballard Power Systems and was first demonstrated publicly in March 2003. The program continued with several component development programs that sustained the development of fuel reformers for more complex and "JP8 like" fuels. The next major demonstration was a synthetic jet fuel fueled PEM APU on a Bradley M2A3 during February 2005 at the AUSA Winter Symposium in Ft. Lauderdale, Florida. This system was designed and assembled through collaborative effort between UDLP, Battelle and Pacific Northwest National Laboratory. The system is significant because it is the first complex hydrocarbon fueled APU and it is the first one installed onto a military combat vehicle.

In addition to reformer based systems, TARDEC has and continues to develop regenerative fuel cell auxiliary power. In this type of system, an electrolyzer uses vehicle power to decompose water into hydrogen and oxygen. The hydrogen is stored and is later used in a fuel cell for silent watch or stand-by electrical power generation. TARDEC has teamed with Hydrogenics to develop this concept, which was first demonstrated as a proof of concept in January 2004. A second phase of the program began in early 2005 to integrate a regenerative fuel cell APU into a Stryker vehicle for demonstration in the fall of 2005.

In January of 2004, TARDEC formed an Integrated Process Team within Mobility Division of TARDEC leveraging the diverse talents across the Center. One of the first major tasks of the IPT was to develop a program plan to take the APU development program to

its next major milestone; the demonstration of a JP8 fueled brass board, with a follow on effort to develop, integrate and validate a JP8 fuel cell APU onboard tactical vehicle.

The current TARDEC effort for a JP8 fuel cell APU has been carefully designed to understand the needs and requirements of the program managers, aggregate these needs into a form, fit and functionality roadmap that will accelerate the technology readiness level of the key technology platforms.

The TARDEC program strategy for development and transition of this technology is a phased approach. For starters, the program is developed around a set of requirements for the Abrams, Bradley and Stryker vehicles. Secondly, the technology thrusts of the program are being driven to meet the requirements of these vehicles. By mid year FY06, there will be a determination if these two paths will intersect. The outcome of the current program is to develop a laboratory system to overcome the technical challenges. If successful, the next step is to integrate the system into a vehicle and perform vehicle evaluations.

### **Potential Solution**

The most promising technology to address these power deficiencies is fuel cell technology. In order to understand the technical challenges of this effort one must understand the basics of how fuel cells work. A fuel cell is an electrochemical energy conversion device that converts hydrogen and oxygen from air into electricity with by products of water and heat. Fuel cells have the unique advantage of be able to separate the fuel from the energy conversion device, thus allowing continuous power generation, assuming that an endless supply of hydrogen and air is available. Oxygen from air is unlimited, however hydrogen, the other key ingredient, which is used in industrial applications, is not a readily available for military applications. Consequently the technical and logistical challenge is to produce hydrogen in the theatre to produce power via the fuel cell.

### **Challenges**

#### **Fuel Cell**

Over the last decade, significant R&D funding from the government and private sector has been directed toward the emerging fuel cell industry, significantly accelerating the technology readiness, reliability and durability. Although no substantial commercial applications have begun, costs of fuel cell components have been decreasing and continuous engineering improvements have drastically advanced the durability of the fuel cell stacks and balance of plant. This effort needs to be leveraged on fuel cell developments for military applications.

One of the many challenges is leveraging the developments in the private and public sector to focus on power requirements for military applications. The key deliverables are technology readiness, affordability durability and reliability. Furthermore, fuel cell system designs need to be focused on the military requirements of performance, ruggedization, reliability and durability, which are all well above commercial sector requires.

#### **Sulfur Removal and Hydrogen Reformation**

Hydrogen is the primary fuel for fuel cells and there are no current plans to add hydrogen to the logistics burden of strategic / tactical operations. The challenge is to produce hydrogen on board from the existing logistical fuel, JP8. Although research activities have been ongoing over the past several years reforming methanol, gasoline, diesel and synthetic diesel to hydrogen suitable for fuel cells, significant technical challenges exist in reforming JP8 to be fuel cell compatible. JP8 is produced in refineries worldwide and depending on the type and origin of the base crude and refining processes; the fuel produced can contain 30-5000 ppm of sulfur. For fuel cells, sulfur and carbon monoxide tolerance, fuel vaporization, and processes to reduce carbon coking are not completely understood. Although there is significant research activity and 6.1 funding to investigate the removal of sulfur and subsequent reforming of JP8, these technologies are in the early stages of development and assessment. It is imperative that a broad assessment of the R&D activities be funded and leveraged to assure that the technology develops into a realistic solution for the soldier.

The use of fuels such as JP8, stress the designs for the conventional fuel processors used to convert the fuel into hydrogen-rich gas. The requirements for an APU also challenge the scalability of conventional fuel processors. The reformation of the JP8 is the most difficult challenge to overcome to make this technology successful, and this is the core focus of TARDEC's effort.

## System Integration

Another significant technical challenge for TARDEC is to ensure that key integration issues for the complete system meet the program objectives. Modularity of components, packaging, synergy and optimization of components and scalability are all essential for the complete integration of the fuel system as an APU. The integration of a fuel cell stack, a fuel processor, sulfur removal process and gas purification process into a functional APU will require close and intimate collaboration with the respective program managers to ensure the necessary balance of plant meets and exceeds the respective overall system requirements with respect to form, fit and functionality. Thermal management and resulting issues of thermal integration and management must be considered and become increasingly complex as the system size is reduced.

## Summary

This is a strategic program to meet the critical power deficiencies that exist today in technical vehicles. It is paramount the following key metrics be established and measured as illustrated below:

1. Risk mitigation through effective and efficient collaboration and knowledge transfer with Government and Industry participants.
2. Desulfurization and reformation of JP8 to yield hydrogen acceptable for fuel cell APU.
3. Fuel cell design, development and validation that meets and exceeds power requirements and is complimentary to desulphurization and reformation activities.
4. System integration activities that optimize the laboratory system to meet test and validation goals and demonstrate a technology path that compliments follow on activities.
5. Roadmap for cost reductions, reliability, durability and ruggedness.
6. Modularity and scalability for adoption across vehicle platforms.

TARDEC is committed to bridging today's power gap for vehicular and mission needs through the development and assessment of a fuel cell APU fueled by JP8. This is a multi-year development program with a strategic roadmap that delivers a complete functional system based on the needs of the program managers and their vehicles. The opportunity for collaboration with other services, agencies and industry will be valuable to the successful outcome of this.

## New Internet scam aims to steal identities, money

*RDECOM Physical Security/Antiterrorism Office*

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Just when you thought it was safe to go back into your Inbox, there's a new form of spam e-mail popping up called **Phishing** or **Pharming**. This problem has become so widespread, that an underground phishing industry has emerged, where sellers offer phishing toolkits, fake Websites and lists of e-mails to spam anyone meeting the price.

**Phishing is designed to steal your identity and your money.** Scam artists try to get you to disclose valuable personal data or other information by convincing you to provide it under false pretenses. These scams can be carried out in person, over the phone, delivered online through spam e-mail or pop-up windows. The emails appear to come from popular web sites or sites that you trust, i.e., your bank or credit card company. These copycat sites are also called "**spoofed**" web sites, which appear official enough that they deceive many into believing that they are legitimate, resulting in the theft of over one billion dollars last year.

**Pharming uses the same kind of spoofed sites, but uses malware/spyware to redirect users from real websites to the fraudulent sites (typically DNS hijacking).** They are able to convince recipients to respond to them by hijacking websites of well-known banks, online retailers and credit card companies.

By responding to phishing and pharming e-mails, you will put your accounts and financial status at risk in three significant ways. First, they can use the data to access your existing accounts and withdraw money or buy expensive merchandise or services. Second, they can use this information to open new bank or credit-card accounts in your name and use the new accounts to cash bogus checks or buy merchandise. Third, some recent phishing schemes have involved the use of computer viruses and worms to disseminate the phishing e-mails to still more people. You may not realize that you have become a victim of identity theft until it's too late.

The following are steps that you can take to decrease your chances of becoming a victim:

- **Be suspicious of any email with urgent request for personal financial information.** They typically ask for information such as usernames, passwords, credit card numbers and social security numbers, etc.
- **Don't use the links in an email to get to any web page, if you suspect the message might not be authentic.** This link could take you to a bogus web site. Instead, call the company on the telephone or log onto the website directly by typing in the web address in your browser.
- **Avoid filling out forms in email messages that ask for personal financial information.** You should only communicate information such as credit card numbers or account information via a secure website or the telephone.
- **Always ensure that you're using a secure website when submitting credit card or other sensitive information via your web browser.** Check the beginning of the web address in your browser address bar – it should be **https://**.
- **Consider installing a Web browser tool bar to help protect you from known phishing fraud websites.**
- **Regularly check your bank, credit and debit card statements to ensure that all transactions are legitimate.** If anything looks suspicious, contact your bank and credit card companies immediately.
- **Pay attention to the URL or a web site.** Malicious web sites may look identical to a legitimate site, but the URL may use a variation in spelling or a different domain.
- **Install and maintain anti-virus software, firewalls and email filters to reduce some of this traffic.**
- **Don't spam other people.** Be responsible and a considerate user. Don't forward every single message to everyone in your address book.

Several major companies and financial institutions that were targeted by phishing and pharming schemes, over the last year were:

American Online (AOL)	eBay
Bank of America	FleetBoston Financial
Bank One	PayPal
Citibank	US Bank
EarthLink	Citizens Bank
Key Bank	MSN
Amazon.com	Huntington Bank
TCF Bank	Washington Mutual Bank
Huntington Bank	Department of Homeland Security
FDIC	Choice

**Remember - It's important to promptly report all possible phishing schemes.** The sooner the proper authorities learn (see links below) about new phishing e-mails and websites, the sooner they can be shut down.

Federal Trade Commission – [uce@ftc.gov](mailto:uce@ftc.gov)

Anti-Phishing Working Group – [reportphishing@antiphishing.org](mailto:reportphishing@antiphishing.org)

Federal Trade Commission Identity Theft - <http://www.consumer.gov/idtheft>

National White Collar Crime Center – <http://www.ic3.gov>

Federal Trade Commission at [spam@uce.gov](mailto:spam@uce.gov)

Internet Fraud Complaint Center of the FBI at [www.ifccfbi.gov](http://www.ifccfbi.gov)



## “Injury, Treat, Die --- Re-Boot!”

**By: Sandy Fowler**

**Principal Investigator Medical Simulation Technologies and  
Sgt. 1st Class Paul Ray Smith STTC RDECOM**

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Army medics-in-training are preparing for upcoming deployments to Iraq and Afghanistan by treating simulated combat casualties in conditions so realistic that they incorporate the look, sounds and smells of war.

The patient simulators of the Combat Trauma Patient Simulation realistically simulate a vast array of conditions to include trauma, weapons of mass destruction, and diseases. The system forces the trainees to assess, stabilize, treat and evacuate their patients. Medics report back that these simulators provide realistic training because they breathe, blink their eyes, have pulses that can be felt and even simulate “death”. Best of all, they won’t stay dead for long, as the simulator can be re-started.

The Soldier Simulation Environments Division at the U.S. Army Research, Development and Engineering Command, Simulation and Training Technology Center has been deploying the Combat Trauma Patient Simulation system to various military users throughout the world. CTPS electronically “moves” the patient and tracks all treatment at each level of patient care, starting at the point of injury. The CTPS system consists of networked patient simulators, along with a triage capability that allows our military medics to train both individually and as a team in the case of mass casualties.

The CTPS system is fielded at the Department of Combat Medic Training, US Army Medical Department Center and Schools in Fort Sam Houston, Texas. Another system resides at the Advanced Medical Test Support Center at Fort Gordon, Ga. The Field Medical Service School at Camp Pendleton Marine Base, Calif., recently received a mini version of the CTPS system. The Army National Guard at Fort Indiantown Gap, Pa., has had CTPS assets since 1998. The First Cavalry Division has two patient simulators in Iraq to provide just-in-time training to medics fighting the war on terror. Future user sites include Fort Benning, Ga., Fort Rucker, Ala., Fort Riley, Kan., Fort Bragg, N.C. and the 101st Airborne at Fort Campbell, Ky.



**Combat Medics training on a simulated battlefield using the Combat Trauma Patient Simulation system at AMEDD C&S, Fort Sam Houston, TX. (STTC courtesy photo)**

## TARDEC displays commitment to joint expeditionary Army at Winter Symposium

*By Paul D. Mehney  
And Cyndi Lynch*

The U.S. Army's Tank-Automotive Research, Development and Engineering Center and its National Automotive Center showcased several vehicle technologies designed to support military operations in Iraq, Afghanistan and South Asia at the 2005 Association of the United States Army Winter Symposium and Exhibition held in Ft. Lauderdale, Fla, Feb 16-18. Representatives from Army Material Command, Training and Doctrine Command, Assistant Secretary of the Army (Acquisition, Logistics, and Technology) and Research Development and Engineer Command viewed state-of-the-art technology including a new vehicle-based water generation and purification unit, a developmental laser module of the Army Mobile Parts Hospital (MPH), two alternative energy vehicles and vehicle survivability and suspension systems.

"TARDEC collaborates with each of the Armed Services, Coalition Forces, the Acquisition and Logistics communities and private industry to increase vehicle survivability and battlefield mobility in support of our Joint Expeditionary Army," said Dr. Richard McClelland, Director of TARDEC. "Our military vehicle technology programs are aimed at reducing logistics while maximizing our expeditionary Army's mobility."

TARDEC's two new water-on-the-battlefield initiatives will deliver dependable sources of potable water to Soldiers. The Water Recovery Unit from Exhaust (WRUE) technology recovers potable water from engine emissions by condensing the water from exhaust gas and purifying it through a three-stage filtration process. The Water Recovery Unit from Air technology can be integrated into other military systems, or serve as a source of standalone water for up to a dozen Soldiers at a time.

The Mobile Parts Hospital, currently deployed to help maintain Operation Iraqi Freedom vehicles, consists of two deployable modules, the Rapid Manufacturing Module and the Lathe Manufacturing Module -- making up the Rapid Manufacturing System. The Rapid Manufacturing Module is able to create a fully dense metal automotive part, replacing the need for bar stock in the field. Once a part is built "near net-shape" in the Directed Material Deposition machine, it goes to the LMM for final finishing and dimensioning. The Rapid Manufacturing System modules are supported by the Command and Control Center, which houses the technical data packages in a product data manager called Windchill<sup>®</sup>, and is also the link for direct communication between the RMS modules and Agile Manufacturing Cell.

"When a vehicle breaks down in a war zone, a Soldier cannot afford to wait weeks or months for the part needed," said Dennis Wend, Executive Director of TARDEC's National Automotive Center. "The MPH is designed to put our brave men and women back into the field in days -- if not hours -- by efficiently manufacturing replacement parts from technical data, computer numeric control code or reverse engineering through laser point technologies."

Receiving much attention for Army leadership and Soldiers was the Full Spectrum Active Protection Close-in LAYered Shield. FCLAS, a Science and Technology Objective, is a near-term developmental short range active protection system capable of defeating RPGs at close range. Army leadership from both TRADOC and AMC commented that this important piece of technology could prove to be an integral piece of RPG protection to forces supporting current operations.



CPT Mike Dunne, TARDEC, briefs LTG Curran, CG TRADOC Futures Center, on latest water distribution and purification programs  
Photo by Paul D. Mehney



Other TARDEC technologies displayed at the AUSA Winter Symposium included:

- “88 Mike,” a developmental software program that can help improve vehicle sustainability and reduce maintenance costs through talking to vehicle telematics and back-end systems.
- Near term and FCS composite armor technology—joint display with Army Research Laboratory.
- A Human Factors Mini-Motion Base Simulator, which can give Soldiers the virtual experience of driving a real vehicle over real terrain.

## Better barriers seal out toxic agents

### *NSC Public Affairs Release*

Collective protection shelters with chemical and biological agent protection have existed since the 1960s.

They historically have been heavy, cumbersome, carried a high logistic burden, and above all been very expensive, but research led by the Natick Soldier Center at the U.S. Army Soldier Systems Center here, is on the path to developing a new generation of shelters to solve these challenges.

The U.S military now has only two viable options for chemical and biological protective materials. These options are either, the expensive, high-performance, decontaminable material Tedlar/Kevlar, or a lightweight, low-cost liner material, which has minimal physical properties, absorbs agent, is non-decontaminable, and carries the logistical burden of shipping, storage and deployment.

During the past several years, the Joint Science and Technology Panel for Chemical and Biological Defense has funded research to investigate and develop the next generation barrier materials for collective protection shelters.

The goal has been to develop a lightweight material with improved ultraviolet and flame resistance, increased durability, improved permeation properties, and decreased material and manufacturing cost compared to currently fielded materials.

To mitigate risk and provide incremental improvements to existing chemical and biological protective barrier fabrics, near-term, mid-term and long-term solutions have been identified and are currently being investigated.

These solutions are constantly being revised as new technologies emerge and existing technologies overcome technical barriers.

To date, the thrust of the research has been focused on fluoropolymer coatings as an after-market process for general-purpose shelter materials, nanotechnological enhancement of commodity polymers, low-temperature processible fluoropolymers and self-decontaminating barrier materials incorporating catalytically-reactive membranes.

#### Fresh coat

The near-term solution has been focused on improving barrier properties through coating general-purpose fabrics currently used in shelters. This approach has the lowest technical risk and is cost-effective. Its key advantage is providing a dramatic improvement in chemical and biological resistance to standard tent fabric with a minimal increase in weight.

Standard tent fabric is a woven polyester fiber with a polyvinyl chloride coating. This coating serves as both a repellent to liquids as well as a means of heat-sealing the fabric, thus increasing manufacturing efficiency.

A major laminating company, Duracote Corp. in Ravenna, Ohio, was contracted to laminate various low-temperature fluoropolymer films of varying thickness to one side and both sides of the fabric. Initial permeation testing results proved very promising.

The best candidate fabrics from the permeation testing were then subjected to physical testing to ensure the coatings didn't have any negative effects on the composite material, such as flame-resistance, infrared signature or interference with the ability to heat/radio frequency weld the fabric using conventional welding equipment.

Initial test results were very positive, and a limited production quantity of the new CB enhanced polyester/PVC fabric was ordered to build a prototype shelter and conduct operational testing.

Unfortunately, the material hit a technical snag from de-lamination and streaking, but researchers are attempting to overcome this technical barrier to provide a transitional near-term solution.

#### Nanoparticles

Approaches just ahead are nanotechnological enhancement of commodity polymers and lower-temperature processible fluoropolymers, which should transition within the next two to four years.

Nanoscale particles introduced into commodity polymers improve barrier properties, and this technology has been applied in various industries, such as food packaging and pharmaceuticals.

Triton Systems, Inc. of Chelmsford, Mass., has successfully demonstrated the improvement in barrier properties for various polymer materials.

Through the introduction of nano-clay platelets at 5-10 percent by weight, barrier properties have increased 30-200 percent for a 10-20 mil thick film.

This increase in barrier properties also is accomplished without significantly changing the physical properties of neat polymers. Furthermore, these platelets have shown an improvement in flame and ultraviolet resistance for the composite.

Triton was contracted by the Army to improve the barrier properties of the currently fielded M-28 liner material as well as improve flame and ultraviolet resistance.

The polyvinylidene chloride barrier is a proven protective barrier. However, improving the flexibility of the barrier film and adding the capability to seal the material with radio frequency equipment could achieve a lower cost of production and manufacturing.

Triton has investigated several proprietary barrier films and demonstrated the improvement of the existing PVDC barrier properties through application of their nanocomposite technology. Initial testing showed a significant improvement in barrier properties through the application of nanocomposite platelets.

Live agent testing was also conducted on Triton's high barrier nanofilm, which showed excellent resistance.

The company is now working on scaling up their technology to produce a non-decontaminable CB-resistant tent liner similar to the M-28. They will also laminate a high-barrier film to a high-strength fabric substrate to produce a decontaminable outer skin fabric. These materials will then be tested and evaluated for physical as well as chemical and biological properties.

#### Lower heat

Low-temperature processible fluoropolymers also have promise in improving CB protection.

An investigation of commercially-available fluoropolymers and chloropolymers of varying compositions was conducted with the goal of finding a low-temperature processible polymer with improved durability, ease of processing, or improved resistance to chemical and biological agents over the existing Teflon.

Once a candidate barrier material was identified, researchers then needed to find a compatible substrate material. The final composite also needed the physical properties of a general-purpose fabric, which meets military requirements, along with permeation resistance of conventional threat agents for 72 hours with no measured detection.

Federal Fabrics-Fibers Inc. of Lowell, Mass., is contracted to produce a void-free lightweight fabric substrate with a chemical and biological barrier, and has successfully demonstrated the ability to produce a low-cost, lightweight, CB resistant, decontaminable fabric.

The company has identified a low-temperature fluoropolymer, which is easily processed with conventional equipment and can readily be heat-welded. The fluoropolymer laminate is also highly resistant to conventional decontamination solutions.

Initial testing of FFF's proprietary low-temperature processible fluoropolymer has shown very promising results, with little permeation in initial simulant testing and little mechanical degradation after decontamination.



FFF has scaled up their facilities and should have production capabilities in place by the end of 2004. Current work is being done to improve efficiency, quality and consistency of the entire process. A prototype shelter will be constructed to further conduct physical, chemical and biological testing on this novel outer skin fabric.

#### Self-cleaning

A long-term solution would involve a revolutionary new system such as a self-decontaminating barrier material incorporating catalytically-reactive membranes.

The Army is currently conducting a technology watch to monitor and identify promising new breakthroughs in academia, industry, government agencies and foreign military programs.

Technical barrier gaps, such as the selectivity of the chemical reactions or stability of required enzymes, will have to be bridged in order to become a viable technology for collective protection.

For more information about the Soldier Systems Center, please visit our website at: <http://www.natick.army.mil>.

## Acoustic sensors go to war

**By Dave Davison**  
**ARL Public Affairs**

Non-conventional warfare, such as it is being waged in Iraq, lends itself to hidden sniper, mortar and RPG attacks and other types of enemy tactics that often can be heard before being seen. The shift in tactics from traditional warfare has increased the Army's interest in acoustic sensors.

"Acoustic sensors offer certain advantages," says Nino Srour, Chief of the Acoustic Signal Processing Branch in Army Research Laboratory's Sensors and Electron Devices Directorate. "They're very inexpensive, small, passive, and provide non-line-of-sight target detection. They're well suited for a wide range of battlefield sensing problems."

He offers an example of a vehicle driving down a road and receiving enemy small arms fire. "Acoustic sensors have been demonstrated to accurately locate the source of the gunfire and allow the vehicle to evade future shots or help direct return fire."

Srour, who has been working in acoustic sensor technology since 1992, has seen the capabilities of the sensors increase significantly.

"Advances in computer capabilities have allowed us to use increasingly more sophisticated algorithms to do more than just detect targets. We have been developing algorithms and low-cost sensor systems to estimate bearing, range, classification and identification of targets," he says.

Acoustic sensors are now being used in current operations in Iraq and Afghanistan for gunfire location. PM CCS, ARL, Armaments Research, Development and Engineering Center and the Rapid Equipping Force delivered a number of the Pilar sniper detection systems to Army units in Iraq. Both fixed site and vehicle mounted systems were fielded in 2003. These systems use one or more microphone arrays to detect and localize the direction of gunfire. The simple display and setup procedures have allowed soldiers to quickly learn the system and use it effectively.

Another important insertion of acoustic sensing technology to the battlefield has been the Unattended Transient Acoustic MASINT Sensor which is used to locate the launch points of mortar fire. UTAMS uses four separated microphone arrays, each of which provides a line of bearing to the firing point. The four lines of bearing are transmitted via radio to a central laptop display where the intersection of the lines of bearing are used to calculate and display the firing point. "A number of systems have been fielded and results from the field have been very good. More systems are likely to be fielded soon," says Srour.

One of the primary uses for acoustic sensors is unattended ground sensors. Srour says the Army is working toward the development and deployment of low-cost UGS that can be distributed at various locations and then networked together to provide reliable and actionable Intelligence, Surveillance and Reconnaissance information over a wide coverage area in the battlefield. These sensors will be able to share and send information to command posts and higher echelons. ARL researchers are working to solve the challenges of sensor fusion and sensor networking to "get one type of sensor to share and hand off information to another type of sensor," he explains.

Srour said acoustic sensors are being developed to work individually or in array configurations where they would act as a lead sensor detecting sound and then "waking up" other sensors such as seismic, magnetic, and optical imagers to aid in target detection, location and identification.

"Each of these types of sensors has one or two things they do very well," Srour says, "and the acoustic sensor is usually the first used. We might use acoustic sensors to determine the bearing of the target then cue a sensor with optical imaging capability to classify the target." ARL is investigating the use of acoustic arrays on aerial platforms such as aircraft and aerostat balloons that could cue electro optic sensors, or help determine if the aircraft is being fired upon.



Looking to the future, ARL is working with military, industrial and academic partners, on a number of advanced concepts including equipping soldiers with sensors either on their uniforms or on their helmets. These sensors will help them locate the source of gunfire, explosions, vehicles or other potential threats.

Researchers are also studying animals and insects to better understand how they perceive and localize sounds, Srour points out. "Some animals process signals better than we can, but we are well on our way to develop algorithms to mimic them," he says.

Acoustic sensors have been around for a long time but with the advances in computing technology, they can provide significant passive ISR capabilities at very low cost. It is clear that acoustic sensors are making a real impact on current operations and they will become even more important in the future.



## Research Development and Engineering Command turns one

By **Trinace Johnson**  
**RDECOM Public Communications**

One year ago this month RDECOM became official by the Department of the Army. This cleared the way for the transference of personnel to the command which began with RDECOM's provisional creation Oct. 1, 2002.

At that time, RDECOM's mission was to put the right technology into the hands of the Warfighters quicker. That philosophy remains the same today. With more than 17,000 military and civilian personnel, full-time contractors, and a responsibility for 75 percent of the Army's science and technology objectives, the command not only sought out, but developed the latest in high-tech equipment, machinery and technology.

What the Army did to create RDECOM, was take eight of the Army's labs and research centers and put them all under one command. The logic behind the merge was to create a "synergy" or combined energy where people could more easily share technological resources with one another and get products out faster under one command.

This past year RDECOM command saw a change at its highest level when Maj. Gen. John C. Doesburg relinquished command to Brig. Gen. Roger A. Nadeau Oct. 28, 2004.

"The change of leadership came at the perfect time," said Richard B. Belmonte, RDECOM, assistant chief of staff. "General Doesburg did an excellent job getting the [RDECOM] concept and selling the concept. General Nadeau is sustaining RDECOM and improving it."

"We're growing and becoming members of a team," said Dr. Robin L. Keesee, RDECOM, deputy to the commander. He said that RDECOM was in the process of defining and centralizing goals while keeping in step with the rapidly changing Army. Keesee held that the configuration of RDECOM is much more appropriate and Soldiers in the field have a much better opportunity to see fielded technology.

Belmonte said in the past year, continued efforts from RDECOM labs and centers have resulted in more of a technology presence in theater, thus shortening the link between the warfighter and RDECOM scientists and engineers.

"Our technology should be there for Soldiers without them giving it a second thought," Belmonte said.

RDECOM civilian researchers from the U.S. Army Tank-Automotive Research, Development and Engineering Center, Warren, Mich. went to Iraq to field advanced prototype robots designed to help protect U.S. Soldier. They created a stand-off inspection tools that enhance Soldier survivability as well as for homeland defense applications-The Percussion Actuated Non-electric disrupter-mount for the TALON robot. The PAN mount has worked successfully for render safe non-obscured explosive devices in the field. TARDEC developed a concept that would allow the TALON to be equipped with an X-Ray device so that the entire Explosive Ordnance Division mission, from X-ray to disruption can be executed while the EOD technician remains at a safe stand-off distance the entire time. In addition, TARDEC is also responsible for the quick fielding of the Humvee Armor Survivability Kit to reduce harm to Soldiers in the CENTCOM area of operations.



More than one hundred RDECOM employees came out for its one year anniversary. Here (from left to right) Mildred Becker, Cathy Sinclair, Brig. Gen. Roger A. Nadeau, RDECOM, commander, Kay Ferris, and Linda Kammer all pose while Nadeau cuts the first slice of the Anniversary cake during the RDECOM First Anniversary Celebration. (RDECOM photo)

Collaborated efforts of labs and centers under RDECOM are responsible for the quick fielding of the Humvee Armor Survivability Kit to reduce harm to Soldiers in the CENTCOM area of operations. From a personal account, 1st Sgt. Michael D. Brown, Echo Company, 115th Forward Support Battalion, Fort Hood, Texas, said that while deployed to Iraq, his soldiers personally used the Survivability Kit on their Humvees.

"Halfway to my destination, my convoy was ambushed with heavy small arms AK-47, Improvised Explosive Devices and rocket propelled grenades," Brown said. He continued, "My vehicle was directly engaged with heavy small arms fire receiving multiple hits...and [the bullets] seemed to bounce off and then explode immediately to my right."

"I am certain that without the kit being installed..., I would not make it home to my wife and daughter safely without even a scratch from this event," Brown said.

"One of the best things that we did was to provide support through some of our inventions to Soldiers in Iraq and Afghanistan," said Col. Mark L. Grotke, RDECOM, chief of staff. "We played a part as a continuing effort across the command to support operations in Iraq." Grotke emphasized that the concept [the joint venture of the labs and centers] of RDECOM is crucial in order to keep moving forward with critical support for U.S. and coalition Soldiers.

Grotke said that one of the hardest things to accomplish this past year was to get all the employees who are now part of RDECOM, to accept the change. "Getting thousands people to do something different than what they've been used to is kind of difficult. It's vital to keep the mind set of RDECOM as opposed to individual organizations," Grotke said.

Grotke added that RDECOM was still having growing pains, but the one thing amongst the centers and thousands of employees that was universally agreed on was the need to maintain focus on supporting Soldiers, both abroad and at home.

"There are still inventions to invent and much needed support to our troops. The sky's the limit to what RDECOM can do."

#### RDECOM Facts:

RDECOM takes its technology out of the laboratories and puts it into the hands of warfighters in the shortest time; provide direct support of the Tech Base to Future Combat System and Future Force; to manage speed and complexity of technological change to operational needs, provide systems engineering, assessment, and analysis engineering support to PEO's/PMs, Materiel Management Centers and current force; and to identify foreign technologies for US Army use.

RDECOM manages more than 17,000 military, civilians and direct contractors; a multi billion dollar annual budget; eight Labs and Research, Development and Engineering Centers; Army Materiel Systems Analysis Activity; Foreign Comparative Testing & Defense Acquisition Challenge Program; Regional International Technology Centers; Capability & Technology Integrated Process Teams; and Agile Development Center. REDCOM Operates World-wide with numerous direct liaisons to field; More than 300 International Agreements; linkage to Combatant Commanders- FAST Teams; and the Engineer and Scientist Exchange Program.



RDECOM employees enjoy the ambiance of the anniversary party.



The 389th Army Band spike up the festivities with various jazz selections.



RDECOM elements include:

- U.S. Army Research Laboratory (ARL), Adelphi, Md.
- Edgewood Chemical Biological Center (ECBC), Aberdeen Proving Ground, Md.
- Natick Soldier Center (NSC), Natick, Mass.
- Simulation, Training and Technology Center (STTC), Orlando, Fla.
- Aviation and Missile Research, Development and Engineering Center (AMRDEC), Redstone Arsenal, Ala.
- Armaments Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, N.J.
- Communications-Electronics Research, Development and Engineering Center (CERDEC), Fort Monmouth, N.J.
- Tank Automotive Research, Development and Engineering Center (TARDEC), Warren, Mich.
- U.S. Army Materiel Systems Analysis Activity (AMSAA), Aberdeen Proving Ground, Md.
- International Technology Centers in: Germany, France, United Kingdom, Japan, Australia, Singapore, Argentina, Chile and Canada.

## U.S. Army- sponsored eCYBERMISSION competition closes its submission period for year three with record numbers

*RDECOM Public Affairs Office*

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eCYBERMISSION, a free, web-based science, math and technology competition for students in grades six through nine, announced its final mission folder submission numbers for the 2004-2005 competition year.



The 2004-2005 eCYBERMISSION competition had a record breaking 1,151 teams submit projects on [www.ecybermission.com](http://www.ecybermission.com), totaling 4,222 students from across the country and in Department of Defense Education Activity schools worldwide. This large number of teams represents a dramatic increase from the 833 teams that submitted projects for the 2003-2004 competition year. This completion rate of just over 60 percent is the best in eCYBERMISSION's short yet brilliant history, surpassing a 51 percent completion in 2004 and 49 percent in 2003.

eCYBERMISSION is a one-of-a-kind competition, sponsored by the U.S. Army that promotes self-discovery and encourages all students to recognize the real life applications of the science and math disciplines. Each one of the competing teams is comprised of three to four students and one Team Advisor. Each team identifies a problem in the community that is related to one of the following four themes: Arts & Entertainment, Health & Safety, Sports & Recreation or the Environment. Teams then compete online by developing Mission Folders that include a hypothesis, research and experiments, and a conclusion. Mission Folders are scored virtually by a team of judges from industry, academia and government.

Students are now eagerly awaiting the judges' decisions for the regional finalists which will be announced April 11 on [www.ecybermission.com](http://www.ecybermission.com). What is on the line for the student teams? The chance to win an educational trip to Washington, D.C., up to \$8,000 in U.S. savings bonds per student, and the honor of achieving the 2004-2005 eCYBERMISSION national title.

For additional information about this competition, please contact either the RDECOM Public Affairs Office at 410-436-4345 [public.affairs@apgea.army.mil](mailto:public.affairs@apgea.army.mil), eCYBERMISSION Mission Control at 1-866-GO-CYBER or [missioncontrol@ecybermission.com](mailto:missioncontrol@ecybermission.com).

## Greening Program allows civilian to live life of a Soldier

**Commentary By Renee Korach**  
**Edgewood Chemical and Biological Center**

As a recently hired Engineer at the Edgewood Chemical Biological Center, I was presented with an opportunity to experience my customer's environment firsthand by participating in a unique training program. Called the Natick Soldier Center Greening Program, it suggested that I could travel to Fort Leonard Wood, Mo., and live the life of the Soldier for a week.

Four other recently hired engineers, Jason Adamek, Chris Gaughan, Christy Hoppe, and John McFadden, also all from Edgewood, took the Greening Challenge. "Greening", a training program conducted by the NSC's Operational forces Interface Group, is intended to provide professional development to Department of Defense civilian Engineers by offering them an opportunity to briefly experience what the Soldier must endure in order to proficiently perform a military mission in a harsh environment. For us, our unit was to be D Co 82d Chemical Battalion, and we learned we were to be embedded with students in Advanced Individual Training. The unit was executing its Phase V Field Training Exercise late last year, where they were to practice all of the training they had received in AIT as they trained to be qualified in Military Occupational Specialty 74D or NBC specialist. Many of the daily concerns of Soldiers were brought to life for us as we personally endured the hardships of the clothing, equipment, and elements that the Soldier must undergo every day.

Once we arrived at Fort Leonard Wood, Sgt. 1st Class Samuel Newland and Spc. Otoniel Rivera of NSC acted as our guides and were the liaisons between the group and the host unit. Before arriving at Fort Leonard Wood we were issued all the necessary clothing to make us fit in and look like Soldiers. We were amazed at all of the clothing and equipment we would be required to pack into a rucksack that looked too small to hold anything more than the sleeping bag. We arrived at the unit looking the part, and were then issued more gear; a protective mask, flask vest, and rubber rifle that looked like and weighed as much as an M16. All of our clothing and equipment was camouflage or green, and only currently issued items were authorized. We accompanied the soldiers in the field on the FTX, from the time they left their barracks to the last day of training. It was extremely beneficial to be embedded with a platoon full-time, rather than participating as a part-time civilian observer. Jason Adamek stated that the experience "allowed us to interact with soldiers and discuss their likes and dislikes regarding equipment."

To begin the journey, we marched in full gear to a pickup point and piled onto cattle cars with no windows. We were all packed like sardines with roughly seventy Soldiers per truck. Rucksacks were resting on Kevlar's, weapons were in uncomfortable positions, and bodies were bent and stretched. The cattle cars took us to the field site where we set up camp. Throughout the week, we ate both meals-ready-to-eat and assembly-line-style warm meals, aka hot chow, slept on cots in groups of on average thirty (in tents made for twelve to fit comfortably), and really felt like Soldiers. I told Sgt. 1st Class Newland "Carrying a rubber weapon for the duration of the program definitely added to the realism of the FTX. We could never leave the weapon. The weapon must always be in hand and accounted for".

The days to follow allowed us to accompany the Soldiers on their daily duties and in fact participate in many missions. These missions included a radiological survey, a chemical survey, operational decontamination, detailed equipment decontamination and detailed troop decontamination. Christy Hoppe stated, "This part of the experience was especially interesting because we were able to see the equipment that we help design being used in the field. It was great to see how the procedures were actually executed, rather than reading about them in a technical manual".

On the last day of training Sgt. 1st Class Newland formed us up and took us on a three mile road march, with a CS gas attack at the halfway point. This event provided a good perspective on the importance of designing reliable, robust, lightweight equipment. Additionally, it reinforced the fact that all equipment must be easy to use. During AIT a limited amount of time was available to learn about each device, and even less time was given for hands-on experience. Finally, after witnessing the soldiers' carry out duties in a night environment, equipment must be easy to operate and attract little attention from the enemy, being both silent and virtually



invisible from a distance. John Mc Fadden stated, "I experienced the confusion of an ambush, the omnipresent oversight of drill sergeants, the strain of a road march with full rucksack, and the fear of hearing a pop followed by dreaded screams of 'Gas! Gas! Gas!'".

There were several mottos and "soldier" talk that we learned were important to live by while out in the field. We had to adjust to a somewhat new language including the following phrases: "hooah", "drill sergeant, yes, drill sergeant", "hasty's", "chow", "weapons count", "stand-to", "fall in", "light's out", "getting smoked", "prop", and "hurry up and wait". One would almost think they were speaking a different language. Furthermore, we quickly learned how to "fall in" to formation, stand at attention, parade rest, and at-ease, as well as perform left-, right-, and about-face. Teamwork was a watchword for the entire company, and became an important watchword for us as well as we watched, participated, listened and learned about our customer when he / she was at his or her best.

Adjusting to the outside life with few amenities proved to be the most challenging of all. Not having adequate time to eat, running water, light, or a working toilet fell into the category of things we as civilians take for granted each and every day. Though our tiredness and soreness were not enjoyable, the experience brought to light the every day life of a Soldier and the conditions in which he / she is expected to function. Chris Gaughan provided the following anecdote: "During the afternoon of the first day in the field, my civilian battle buddy, John McFadden, an alternating pair of privates, and myself were given the privilege of digging a regulation size foxhole with a depth to the shoulders of the tallest man in the company, in our case 6' 3", which was described by a Specialist to be a three day task. Through the dark, rain, and soreness associated with breaking through solid rock, the mission, just one of many for each private, had to continue and in fact was completed over roughly a day".

Overall, our training was a tremendous success and in fact as an outsider you would have never even known that five civilians were embedded amongst the ranks with trainees, officers and drill sergeants. We learned much about the Armed Forces and their need for engineers. Now, we as newly hired engineers have a greater appreciation and direction for our work. We will be able to use the experience to maintain true customer focus and develop the right equipment the Soldier needs to accomplish the mission. We thank Newland and Rivera and the Operational Forces Interface Group for providing us the opportunity to participate in this program and special thanks to Specialist Rivera for coming along for the ride and providing his excellent insight. "Hooah"!!!



## IOBC-RDT project replicates live fire for OBC students

**By Bill Pike**

**Science & Technology Manager**

**Simulation and Training Technology Center**

**and Tim Wansbury**

**Support Contractor STTC**

The Infantry Officer Basic Course-Rapid Decision Trainer is a joint research project developed over the past two years by the US Army RDECOM, Simulation and Training Technology Center and the US Army Infantry Center and School at Fort Benning, GA. The IOBC-RDT is a low-cost, PC-based, virtual training simulation that was created to better train and prepare infantry second lieutenants to participate in the squad- and platoon-level, live-fire training exercises conducted during the 16-week, Infantry Officer Basic Course.

The IOBC-RDT was developed using open-sourced, game engine-based technology and provides an immersive, interactive, virtual training simulation which replicates the IOBC squad and platoon live-fire exercises conducted at Ft. Benning. The trainer incorporates advanced performance assessment tools and techniques to assist in evaluating a student's decision-making skills while directing subordinate units and executing infantry battle drills in a virtual training environment. The IOBC-RDT is currently a single-player application, although a multi-player capability is possible for the future.

The current version of the IOBC-RDT contains two base-level training scenarios which replicate the IOBC squad and platoon level live-fire exercises conducted on the Ware and Griswold Live-Fire Ranges at Fort Benning. Subject matter expertise was provided by the 2nd Battalion, 11th Infantry Regiment Fort Benning Ga., from soldiers attached to the STTC who have recently returned from Operations Iraqi and Enduring Freedom.

The IOBC-RDT provides a low-cost solution to what was otherwise a difficult training challenge for course instructors at IOBC. Prior to the development of the IOBC-RDT, resource constraints (principally time) severely limited the number of students who were given an opportunity to assume key leadership roles (e.g., platoon leader, squad leader, team leader) and demonstrate their knowledge of key doctrinal principles during an IOBC live-fire exercise. Today, the fielding of the IOBC-RDT makes it possible for all IOBC students to play one of the key leadership roles (squad leader during a squad exercise and platoon leader in the platoon exercise) in the virtual environment and to do so during several iterations of the same scenario. This new capability provides each student with an opportunity to develop as well as demonstrate their knowledge of the key principles in a standard training environment.

Each IOBC-RDT training scenario contains four phases – Introduction, Planning, Mission, and Assessment. The exercise begins with the student logging on and establishing a separate game log for each training event using his name and student ID number.

- The Introduction provides a short four-minute briefing by an avatar who describes the purpose of the training, the tasks, conditions, and standards for the training, and the required doctrinal references for the training.
- The students perform a number of tasks during the Planning Phase in preparation for the mission. These tasks include a review of the company or platoon operations orders and map overlays; complete task reorganization; establish signal and fire support plans; and conduct pre-combat inspections.



**Sgt. 1st Class Shannon Swain and Staff Sgt. Howard Hizer conduct evaluations of the IOBC-RDT system for STTC. Swain and Hizer are members of the Florida National Guard on the "Wounded Soldier/Medical Hold Program" from OIF/OEF. They are assigned to STTC to provide Subject Matter Expert support while receiving their medical treatment. (STTC courtesy photo)**



- The mission scenarios are played out during the Mission Phase and include those actions required during unit movement-to-contact, reaction-to-contact, and consolidation/reorganization.
- The Assessment process uses a combination of both embedded and self-assessment techniques to evaluate a student's performance. Feedback is provided to the student during After-Action-Report. A record of performance is maintained on the student's computer and a copy of the record can be forwarded to an instructor for additional evaluation.

The STTC delivered the latest version of the IOBC-RDT to the Infantry School last month. With assistance from Army Research Institute, students from all four IOBC student companies are testing and using the trainer to prepare for up-coming squad and platoon live-fire exercises. Initial feedback from instructors has been very positive. Additional copies of the IOBC-RDT have been distributed for evaluation to the TRADOC DCSOPS&T, Headquarters Cadet Command, and the Department of Military Instruction, US Military Academy.



## High technology, small business collaborate

*By Susan Nichols, Small Business Innovation Research Program Manager, MAJ Robert J. Miceli, Deputy Program Manager, and John H. Ruehe, P.E., BRTRC, Inc.*

To maintain its technological edge and field the right equipment to our soldiers in the shortest time, the Army cultivates a strong research and development partnership with industry and academia. Agile, free thinking, small (fewer than 500 employees), high tech companies often generate the most innovative and significant solutions to meet our soldiers' needs. One program that the Army uses to harness these talents for the benefit of our soldiers is the Small Business Innovation Research Program. The SBIR Program provides timely investment capital, enabling small companies to develop dual-use technologies and products to bring to the marketplace. Dual-use is defined as technologies that, first and foremost, benefit the soldier, but which also are commercially viable.

Established by Congress in 1982, the SBIR Program is currently reauthorized until 2008. Under the law, the Army reserves 2.5 percent of its extramural R&D budget for competitively selected SBIR awards to small businesses. Extramural budget is defined as the portion of funds put on contracts to private companies. The SBIR budget for 2005 is \$233M. The goal of the dual-use SBIR Program is to tap into the innovation and creativity of the small business community to help meet Army R&D objectives. At the same time, as an added incentive, these small companies develop technologies, products, and services that can be commercialized through sales in the private sector or back to the government, e.g., the Army.



Successful SBIR projects move through three phases. Small businesses enter the SBIR process by submitting concepts in the form of Phase I proposals against solicitation topics that address current and anticipated warfighting technology needs. Phase I is the program entry point where a company proves the feasibility of its concept in six months for up to \$70,000. An option for up to \$50,000 may be exercised at the Army's discretion, to fund start-up Phase II activities for Phase I projects which have been selected for Phase II negotiation and award. Phase II is a substantial R&D effort, up to \$730,000 over two years, and is intended to result in a dual-use technology, product, or service. The Army's Phase II Plus Program provides up to \$250,000 matching SBIR funds to extend an existing Phase II another year if the small business can find outside non-SBIR funding from a private or government source. If successful, the small business potentially can receive a total of \$1.1 M in Army SBIR funding. In Phase III, the successful company markets its dual-use product or service either to the government, the private sector, or both. No SBIR funding is provided in Phase III. The SBIR Program is very competitive; the Army received 3271 Phase I proposals in response to the 04.3 Solicitation. About one in 10 Phase I proposals were selected for award.

The Army Research Office – Washington, Army Research Laboratory (ARL) located within the Office of the Deputy Commanding General, Systems of Systems Integration, Research, Development and Engineering Command (RDECOM) manages the SBIR Program. This physical location helps ARO-W integrate and transition SBIR projects to other R&D activities including the Training and Doctrine Command Futures Center, the Capability/Technology IPTs, and the Army Technology Objective Managers. The SBIR Program Manager formulates and publishes policy and guidance and manages the efforts of the participating organizations as they generate SBIR topics, evaluate Phase I proposals, award and monitor Phase I contracts, solicit and evaluate Phase II proposals, and transition the management of resulting Phase II efforts to the appropriate Army R&D organization.

Within this program, individual project management is conducted by a network of laboratories and centers located within the Army's major commands:

- Army Materiel Command, its subordinate RDECOM which includes the Army Research Laboratory; the Simulation, Training and Technology Center; and six Research, Development and Engineering Centers
- Army Test and Evaluation Command;
- Space and Missile Defense Command;
- Medical Research and Materiel Command;

- Corps of Engineers;
- Deputy Chief of Staff for Personnel's Army Research Institute.

New this year is the inclusion of the acquisition programs, program executive offices and program management offices in the SBIR Program. On a pilot basis, each PEO has been allocated two topics to be published in the 05.2 Solicitation and the ability to directly manage the resulting SBIR projects.

The future readiness and effectiveness of our armed forces will be determined, in large measure, by the Army's investment in relevant technologies. The SBIR Program plays a vital role in ensuring that today and tomorrow's soldiers are prepared to meet the challenges they face. Most often, innovative technologies are invented by creative individuals and small, entrepreneurial companies that truly think "outside the box." By capturing the talents of the U.S. small business community, the Army SBIR Program benefits the Army, the private sector, and our national economy.

For more information about the SBIR and STTR Programs, visit the Army Research Office-Washington website at <http://www.aro.army.mil/arowash/rt> . General information on ARO can be found at <http://aro.army.mil>.

## Keesee named Deputy to the Commander RDECOM

### *RDECOM Public Communications Office*

Brig. Gen. Roger A. Nadeau, commander of the U.S. Army Research, Development and Engineering Command, has announced the assignment of Dr. Robin Keesee as the Deputy to the Commanding General, RDECOM. The effective date of Dr. Keesee's appointment was March 6.

Dr. Keesee has been serving as acting deputy to the commander since May 2004.

In making the announcement, Nadeau said, "Dr. Keesee is eminently qualified for this crucial position based on his many distinguished qualifications and outstanding potential. We look forward to his continued success and proven leadership as he helps in these challenging times to direct our RDECOM to the new horizons that are so vital to the continued success of our warfighters around the world."

As the Deputy to the Commander RDECOM, Dr. Keesee will direct the Army's intensified research, development and acquisition process for fielding technologies that sustain America's Army as the premier land force in the world.

Dr. Keesee earned his Doctorate in Human Factors in the Department of Industrial Engineering and Operations Research at the Virginia Polytechnic Institute (VPI) and State University in 1976.

He was commissioned in the United States Army Reserves from ROTC at VPI in June 1970, at which time he received his Bachelor's Degree in Industrial Engineering. He performed his active duty training from June to September 1971, and was MOBDES to the Comptroller Directorate at the U.S. Army Materiel Command from 1971 to 1976.

In June 1982, Dr. Keesee joined the Army Research Institute, and was assigned to the Systems Manning Technical Area of the Systems Research Laboratory until August 1983, when he became Chief of the Research Coordination Office at the Training and Doctrine Command in Fort Monroe, Virginia. In August 1984, Dr. Keesee was reassigned to the ARI Headquarters in Alexandria, Virginia as Chief of the Plans, Programs and Operations Office where he served until his appointment as Director of the Systems Research Laboratory. In August 1992, he transferred to the Human Research and Engineering Directorate, ARL, where he was until his appointment in May 2004 to RDECOM.

Dr. Keesee is a member of the Human Factors and Ergonomics Society, Society of Logistics Engineers, Alpha Pi Mu, and Sigma Xi, and a senior member of the Institute of Industrial Engineers.



## ARL scientists win ACS Award at Fuel Chemistry Division Symposium

By Paul Schmitt  
ARL Public Affairs Office

Two Army Research Laboratory scientists recently received a prestigious award from the American Chemical Society.

Dr. Ivan Lee and Dr. Deryn Chu, of ARL's Sensors and Electron Devices Directorate, were awarded the Richard A. Glenn Award for outstanding paper at the Fuel Chemistry Division Symposium, held from March 28 – April 1 of last year.

The title of Dr. Lee's and Dr. Chu's paper was "Nanocrystalline Gold Ceria-Based Water-Gas Shift Catalysts for Fuel Cell Applications." Their research focused on using metal-based catalysts in fuel processing so as to more efficiently clean up carbon monoxide during the production of hydrogen.

The project was funded through ARL's Director's Research Initiatives, a program which funds in-house research for approximately two years. The DRI's goal is to promote research that is both innovative and mission-specific. A panel of scientists, the ARL Fellows, carefully scrutinized each proposal and ranks them on individual merit.

Dr. Allen Grum, Associate Director, noted that the research in fuel cells would more efficiently provide power to the American Soldier. Grum was also delighted at the recognition conferred upon Lee and Chu.

"To win an award like that for a DRI project is a genuine honor," Grum said.

Both Lee and Chu expressed their gratitude for the DRI program.

"The DRI program helped pay for our equipment and our labor," noted Chu. "We're still using that equipment for ongoing research."

The award originated in 1956 as a means to recognize outstanding papers at division symposia. In 1972, the ACS named the award after Richard A. Glenn, who had served as Assistant Director of Research at Bituminous Coal Research, Inc. Competition is intense, with only one paper out of ten reaching the finalist stage, and only one paper demonstrating the highest technical merit and oral presentation is selected for the award.

DR. Lee and Dr. Chu will be formally presented with their award on March 15 during the 229th ACS National Meeting in San Diego, CA.



**Caption: Dr. Deryn Chu, left, and Dr. Ivan Lee of the Army Research Laboratory**

## CERDEC names new Command and Control director

*By Daphne Hart*  
**CERDEC Public Affairs**

The Communications – Electronics Research, Development and Engineer Center's Command and Control Directorate has a new director.

Since officially assuming C2D's reins on Feb. 7, Dr. Gerry Melendez has been busy learning about the directorate and making plans to ensure it remains a vital part of the United States Army.

"My belief is that we need to stay relevant to the future by looking at Army transformation, but at the same time stay grounded in the present by looking at the current force and ongoing operations," Melendez said. "In my mind, if you do those two, you'll have an organization that's relevant and viable."

To that end, the new director is restructuring C2D's front office to more closely align with his vision; in addition to the traditional civilian and military deputies, Melendez is establishing a new position to help with the strategic growth of the organization.

Pete Glikerdas, formerly the Intelligence, Surveillance and Reconnaissance Sensors Lead at Project Manager Unit of Action Network Systems Integration, will be focused on the directorate's day-to-day operations as its Deputy Director, while former Acting C2D Director Darrell Davis will be the newly-created Associate Director for Technology, a position in which he will serve as the technical lead for the organization.

"I'm looking forward to the new opportunity to enhance the directorate's contribution to the CERDEC's vision and the Army's transformation," Glikerdas said. "I am very excited to join the talented professionals in this directorate and I am looking forward to being part of the C2D team."

Davis, whose new role is focused on improving C2D's strategic posture by developing new business areas and ensuring that current technology-based efforts remain relevant while positioning the directorate one to five years in the future, also expressed his enthusiasm.

"I am anxious to focus on the programmatic and technical aspects of the directorate and I am looking forward to working with the new leadership to map out the future for command and control," he said.

One of the reasons for the front office restructuring is that Melendez believes strongly in the directorate's potential.

"The Command and Control Directorate is not just command and control" Melendez said, and cited "very important business areas, such as batteries, chargers, power generators, navigation, and also outstanding quick reaction capabilities" as examples.

Given the current trends in Army research and development, specifically the emphasis on "the network" Melendez believes that his directorate is primed for growth.

"By the end of fiscal year 2006, I expect to grow the directorate by 10 percent," he said.

But he also has more immediate plans.

C2D's new leader wants to "stabilize the organization" within three months and complete actions that were put on hold during the time period when it did not have a permanent director.



**Dr. Gerry Melendez (right), the new C2D director, meets with Pete Glikerdas, C2D's new deputy director, and Lt. Col. Duane Amsler, the directorate's military deputy. (CERDEC Courtesy Photo)**

"In parallel to that, we're working on getting a better definition of what the strategic position of the directorate needs to be three years out and five years out," he said, before adding that C2D's goals and vision will be reevaluated within the next six months, and a plan will be formulated to align the directorate's path towards its strategic goals.

He has already started that work by holding sensing sessions with C2D's division chiefs and other senior leaders both inside and outside the directorate to determine areas of strength and those that might need improvement.

"I found that the directorate has outstanding leadership and unequalled workforce expertise in their technical areas," he said. "The level of competency here has really impressed me."

The San Juan, Puerto Rico native received a bachelor's of science in biomedical engineering from Tulane University in 1980.

Melendez began his career with the Army in 1983 after earning a master's of science in electrical engineering from Brown University in 1983 and continued his education in communications through a post-master's program at Princeton University from 1984 to 1986.

In 1987, Melendez was awarded a Department of the Army Fellowship that allowed him to initiate doctoral studies in electrical engineering at Drexel University, which he completed in 1993.

His most recent degree is a master's in strategic studies, which he received from the Army War College in 2002.

In addition to his academic achievements, Melendez has also served in numerous positions throughout the then-U.S. Army's Communications-Electronics Command's Research, Development and Engineering Center, including as chief of the Automatic Target Recognition Team for Product Manager Tactical Endurance Synthetic Aperture Radar, where he managed a group of engineers who developed target recognition algorithms.

In 1996, Melendez became chief of the Intelligence and Information Warfare Directorate's Battlespace Identification Branch. He then served in a dual-hatted role as chief of the Combat Identification Special Projects Office and as technical manager for the Coalition Combat Identification Advanced Concept Technology Demonstration.

Melendez had been the deputy project manager for PM UA NSI, where he grew a five-person office into an organization with 140 employees responsible for the development, integration and fielding of the communication, computers, command, control, sensors and middleware capabilities for the Army's future forces, from July of 2002 until his promotion to director of C2D.

"I'm very excited to be here. I think that C2D is positioned for good things to increase its relevancy, both in the present as well as to help transform the future of the Army," Melendez said. "From where I'm standing, I see only good things for C2D."



## Dr. Bhatt Selected as a Fellow of the American Ceramic Society

### *ARL Public Affairs Office Release*

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Dr. Ramakrishna T. Bhatt of the Army Research Laboratory has been selected as a Fellow of the American Ceramic Society.

A senior researcher at ARL's Vehicle Technology Directorate, NASA Glenn Research Center, Cleveland, Ohio, Bhatt was recognized for his "significant contributions in the basic understanding of monolithic ceramics, fibers and fiber-reinforced ceramic matrix composites." He has authored and co-authored more than 140 publications and three book chapters, and holds three patents.

Fellows are distinguished members who have made outstanding contributions to the ceramic arts or sciences; through broad and productive scholarship in ceramic science and technology, by conspicuous achievement in ceramic industry, or by outstanding service to the Society.

ACerS serves the informational, educational, and professional needs of the international ceramics community. The Society comprises a wide variety of individuals and interest groups that include engineers, scientists, researchers, manufacturers, plant personnel, educators, students, marketing and sales professionals, and others in related materials disciplines.

Bhatt will be presented his award at the ACerS annual meeting this year in Baltimore, MD.



## Greening goes 'basic'

### NSC Public Affairs Release

Gaining field experience with Soldiers under the Greening Program took a new twist when five Soldier Systems Center employees participated in a week of basic combat training at Fort Leonard Wood, Mo.

Typically coordinated with units conducting field training exercises, Sgt. 1st Class Sam Newland, Natick Soldier Center's senior enlisted advisor and Greening noncommissioned officer in charge, was invited by the 14th Military Police Training Brigade to lead a Greening class for the first time with a company of recruits.

The employees soldiered through Week Seven, using all of their issued individual combat equipment as they lived among the Soldiers, eating the rations, digging fighting positions, reacting to a simulated chemical attack and carrying a dummy M-16 rifle.

The group broke away periodically from the controlled schedule to review what they've learned, and at the end of their four days conducted a 3-mile road march led by Newland.

"They did extremely well. It was kind of shock therapy at first," he said. "I put them right into a basic training platoon. They were gainfully employed throughout the (field training exercise), but I occasionally pulled them away from the recruits to give them a chance to digest what they had observed and learned."

Pfc. Trung Nguyen, a human research volunteer who has since moved on to become a Ranger, assisted Newland "to bring fresh experience with me," he said.

The Natick Soldier Center Greening Program is designed to give scientists and engineers with no military experience a better understanding of the military culture so that they can apply that knowledge on the job, according to Newland.

"It's all experiential learning as opposed to classroom learning," he said. Kevin Connolly, a mechanical engineer on the Aerial Delivery Engineering Support Team, said he decided to attend because he thought it would be a good experience, and he wanted to see what Soldiers go through physically.

"I was a little nervous. It was a little intense, but I'm in decent shape, so it was O.K.," Connolly said.

To help ease their transition into the basic training class, Sgt. 1st Class John Langton, a senior drill sergeant with Company C, 1st Battalion, 304th Infantry, a Reserve unit in Londonderry, N.H., was invited to the Soldier Systems Center for a one-day course with the Greening participants on becoming a Soldier.



Chris Gaughan receives a class on the application of camo face paint upon arrival in the field. (NSC Public Affairs Photo)



SPC Rivera assists Renee Korach with her layers of protective clothing. (NSC Public Affairs Photo)



They became acquainted with drill and ceremony, map reading and other skills to help give them a good idea of what to expect, said Dan Harshman, an equipment specialist with NSC's Operational Forces Interface Group and reservist in Langton's unit.

"I appreciate what (Soldiers) do even more," said Marc Tardiff, a mechanical engineer on the Aerial Delivery Engineering Support Team. "Since I deal with them so often, I have new insight into their thought process. It makes me a more efficient employee."

The other employees who participated are David Colanto, mechanical engineer, Ballistics Technology Team; Chenxi Dong, chemical engineer on the Chemical Technology Team and Christine DiSanto, a textile technologist on the Aerial Delivery Engineering Support Team.



**The Greening group learns the importance of a functional mask during the road march. (NSC Public Affairs Photo)**

## RDECOM Magazine needs a new name

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The RDECOM Magazine is looking for a new name. The name should be something that identifies the essence what the products and people of RDECOM are all about. If you have a name you would like us to consider, please e-mail your suggestion and why you chose it, along with your name, phone number and organization to: [rdecommag@apgea.army.mil](mailto:rdecommag@apgea.army.mil) by April 30.

The person whose new name suggestion is chosen will be announced in an upcoming Magazine.

(RDECOM Public Communications Office)

## New face to lead Soldiers at AMC

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Headquarters Army Materiel Command will soon see a new face leading its enlisted Soldiers and non-commissioned officers.

Command Sgt. Maj. Daniel Elder will succeed Command Sgt. Maj. Tyler Walker, II as the 10th AMC command sergeant major. Elder is due to report to his new position in early July.

A native of San Bernardino, Calif., Elder joined the Army in January 1982 and attended Basic and Advanced Individual Training at Fort Knox, Ky. He is currently serving as the command sergeant major for the 13th Corps Support Command.

The AMC command sergeant major is a special advisor to the AMC commanding general- delivering all news, good and bad, regarding the state of the command, including the enlisted workforce and civilians.

"The incoming command sergeant major must talk and interact with the workforce because there is so much that happens outside of those office doors," said Command Sgt. Maj. Walker. "You have to allow the workforce to express concerns and solutions to problems that may exist. It's all about being a team, and them having the confidence in you to lead them."

(AMC Public Affairs)



## Electric drive for Army's Stryker Mortar Carrier Vehicle tested

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A special engineering team based in Picatinny, N.J. will integrate and test a new electric drive, automated fire control system prototype for the Army's Stryker Mortar Carrier Vehicle, officials have announced.

The Stryker is a special armored-wheeled vehicle that maneuvers more easily in close and urban terrain while providing open-terrain protection.

The Stryker mortar carrier is the basic Stryker equipped with a 120mm mortar system.

The mortar carrier vehicle, which is one of 10 different variations of the Stryker, provides indirect fire support to Soldiers in the Army's six Stryker brigade combat teams.

Engineering personnel from the Armament Research, Development and Engineering Center here and four technology partners -- Mistral, Elbit, EFW and Soltam -- will focus on demonstrating the feasibility and benefit of automatic pointing for mortars.

The effort is scheduled to take six months to complete. It will be divided into three different phases: software and system interface design and integration, non-firing demonstration and firing demonstration.

Officials say the project should provide a number of benefits including faster response time, increased lethality, increased crew survivability and reduced workload and cost of operation.

(AMC Public Affairs)

## Picatinny-based team demonstrates world's first GPS-guided artillery projectile

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A joint U.S and Swedish development team based at Picatinny Arsenal recently fired the world's first guided artillery projectiles using global satellite positioning technology.

The 155 mm projectiles used global positioning satellite and Micro-Electro-Mechanical Systems, known as MEMS, to guide to within 3.4 and 6.9 meters of a target located 20 kilometers from the firing site, according to Lt. Col. William Cole, product manager for the Army's Excalibur Program.

Cole said that one Excalibur round was fired from the new Joint Lightweight 155 mm Howitzer, and the other round was fired from an M284 Paladin gun tube, both using a Picatinny-developed Modular Artillery Charge System 4, known as MACS 4, propelling charge.

"These tests mark a key milestone toward the fielding of Excalibur in conjunction with the M777 Joint Lightweight Howitzer in fiscal year 2006," Cole said. The M777 and Excalibur are slated for delivery to a Stryker brigade in the 25th Infantry Division.

Excalibur's accuracy is expected to reduce collateral damage and make gun artillery a force multiplier for commanders on the ground. When fielded, Excalibur will deliver a variety of lethal payloads to targets up to 40 kilometers away when fired from a 39-caliber howitzer.

The program, which is a cooperative development effort between the U.S. and Swedish governments, is a key part of transforming cannon artillery to provide responsive precision-strike capability.

(AMC Public Affairs)

## Field gear issued to deploying Soldiers

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U.S. Army Europe Soldiers scheduled to deploy to Afghanistan for Operation Enduring Freedom are being issued the latest in field gear through the Rapid Fielding Initiative.

RFI is run by the Program Executive Office Soldier and the Army Materiel Command Field Support Brigade - Europe. Together, they serve as the "readiness bridge" linking America's arsenal to USAREUR's Soldiers.

The Army Chief of Staff initiative identifies equipment deploying Soldiers especially need. The equipment enhances the individual Soldier's mobility, lethality, level of force protection, and provides mission essential equipment and individual weapons' optics.

To date, 3,700 Soldiers from USAREUR units have received the latest in field gear: the Advanced Combat Helmet, improved desert boots, moisture wicking undergarments, knee and elbow pads, weapons, and add-ons such as close-combat optics.

The majority of the equipment arrived just after Christmas, and by Jan. 5, had started moving into Soldiers' hands, according to Gary James, site manager of AMC FSB-Europe's Germersheim Staging Activity.

(AMC Public Affairs)



## Ceramic plates negotiated for testing

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The U.S. Army Research, Development and Engineering Command, on behalf of U. S. Army Soldier System Center, Natick, Mass., announced its intentions to negotiate and award a sole source purchase order to Armor Works, Inc. of Tempe, Ariz., for 200 samples of ceramic plates for testing and evaluation. There are specific design features engineers would like to examine to determine the level of protection the plates provide against various threats. Armor Works is providing tiles in varying materials, thickness and dimensions for the test with the stipulation that they meet all current weight and dimensional requirements.

(AMC Public Affairs)



## Students follow shadow at SSC

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National Groundhog Job Shadow Day was locally observed at the Soldier Systems Center, Natick, Mass., Feb., 2 with three local high school students following the work schedule of select employees and Soldiers for several hours.

Job Shadow Day, held annually on Feb. 2 since 1998, commences a yearlong initiative that gives students across America a chance to "shadow" a workplace mentor as he or she goes through the day on the job, according to the Job Shadow Web site.

The program ties into the School to Career program shared between the installation and local schools during the past decade, according to Marilyn Joy, Garrison special programs manager. Each school has a coordinator to help match that student with employees at an area business or organization.

The students came from Ashland, Framingham, Holliston, Hopkinton, and Natick for the half-day visit.

(NSC Public Affairs)